

The Canadian Field-Naturalist

SUPPLEMENTARY MATERIAL:

Evolutionary isolation of Canadian terrestrial vertebrate species

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APPENDIX S3. Augmenting the global trees for newly recognized Canadian species.

Two mammals and 12 bird species are recognized as such in Canada but not in the global databases used to produce the global phylogenies we used (Table S1). We therefore had to modify the global trees to include them. We illustrate how we did this using an example.

Two mammal species found in Canada are not in the Upham *et al.* (2019) mammal phylogeny, but are recognized by Wild Species Canada (our taxonomic source): Pacific Marten (*Martes caurina*), formerly within American Marten (*Martes americana*), and

Western Water Shrew (*Sorex navigator*), formerly within American Water Shrew (*Sorex palustris*; Carr and Hicks 1997; Dawson and Cook 2012; Hope *et al.* 2014).

The species ages for these two recently-elevated species have been estimated at 2.6 and 0.5×10^6 years, respectively (Hope *et al.* 2014; Schwartz *et al.* 2020). For both, this new age is very close to 0.5 times the encompassing species' age in the Upham *et al.* (2019) mammal tree, akin to attaching the new species on the

TABLE S1. Species additions to the bird and mammal trees and their sister species.

Class	New species	Sister species	Sources
Mammals	Pacific Marten <i>Martes caurina</i>	American Marten <i>Martes americana</i>	Carr and Hicks (1997); Dawson and Cooke (2012)
Mammals	Western Water Shrew <i>Sorex navigator</i>	American Water Shrew <i>Sorex palustris</i>	Hope <i>et al.</i> (2014)
Birds	Wilson's Snipe <i>Gallinago delicata</i>	Common Snipe <i>Gallinago gallinago</i>	Mueller (2020)
Birds	Tundra Bean-goose <i>Anser serrirostris</i>	Taiga Bean-Goose <i>Anser fabalis</i>	Carboneras and Kirwan (2020)
Birds	Mexican Whip-poor-will <i>Antrostomus arizonae</i>	Eastern Whip-poor-will <i>Caprimulgus vociferus</i>	Chesser <i>et al.</i> (2010)
Birds	Sagebrush Sparrow <i>Artemisiospiza nevadensis</i>	Bell's Sparrow <i>Amphispiza belli</i>	Chesser <i>et al.</i> (2013)
Birds	Barolo Shearwater <i>Puffinus baroli</i>	Audubon's Shearwater <i>Puffinus lherminieri</i>	Sangster <i>et al.</i> (2005)
Birds	Scripps's Murrelet <i>Synthliboramphus scrippsi</i>	Guadalupe Murrelet <i>Synthliboramphus hypoleucus</i>	Chesser <i>et al.</i> (2012)
Birds	Winter Wren <i>Troglodytes hiemalis</i>	Eurasian Wren <i>Troglodytes troglodytes</i> *	Chesser <i>et al.</i> (2010)
Birds	Snowy Plover <i>Charadrius nivosus</i>	Kentish plover <i>Charadrius alexandrines</i> *	Küpper <i>et al.</i> (2009)
Birds	Eastern Yellow Wagtail <i>Motacilla tschutschensis</i>	Yellow Wagtail <i>Motacilla flava</i> *	Banks <i>et al.</i> (2004)
Birds	Black Scoter <i>Melanitta americana</i>	Common Scoter <i>Melanitta nigra</i> *	Sangster <i>et al.</i> (2005); Collinson (2006); Chesser <i>et al.</i> (2010)
Birds	Pacific Wren <i>Troglodytes pacificus</i>	Eurasian Wren <i>Troglodytes troglodytes</i> *	Chesser <i>et al.</i> (2010)
Birds	Common Gallinule <i>Gallinula galeata</i>	Common Moorhen <i>Gallinula chloropus</i> *	Chesser <i>et al.</i> (2011)

*Sister species not found in Canada, meaning the Canadian tree shape was not affected by the addition.

respective global trees halfway up the branch leading to the encompassing (now sister) species. This observation supports the approach taken by Barraclough and Vogler (2002), Edwards and Still (2008), Oufiero *et al.* (2011), and Biega *et al.* (2019) when faced with the same problem of new species addition to a phylogeny and the one we took as well. We first identified each encompassing species on the global tree, and then assumed that half of the global terminal branch (or Pendant Edge, PE) of that species was the new species age for the two new sisters. Using this species age estimate, the evolutionary distinctness (or FP, for Fair Proportion) for the two sister species was recalculated as:

$$FP_{new} = \left(\frac{PE}{2}\right) + \left(\frac{PE}{4}\right) + (FP - PE)$$

Where FP_{new} represents the new score for both the added species and its sister, and PE and FP represent the original median FP and original PE value (before the addition of the new species) of the sister species. So, if we ignore these new species, the national ED score for American Marten would be 11.30 my (million years), and the national ED score would be 7.03 my for American Water Shrew; with the taxonomic revision, the two martens are given a score of 9.70 while the two water shrews each represent 6.79 my of evolutionary history in Canada.

We repeated this for the 12 bird extant species recognized by Wild Species Canada that were not in our global tree, noting that for six of these, the encompassing sister species is not found in Canada.

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